

# TECHNICAL INFORMATION COMMUNICATION



**United  
Technologies**

Building & Industrial Systems

Quality and Continuous Improvement

**Number:** TIC2015-0017

**Date:** 9/23/2015

**Title:** Inverter Unit (5 Stage) Quality Improvements

**Product Category:** Air Conditioners/Heat Pumps

## Products Affected

24VNA9/189BNV  
25VNA8/288BNV

## Situation

BIS has identified system situations and/or installations practices that indicate the unit is in a reporting and/or protection mode. With additional information the field can understand system conditions and or troubleshoot a system to correct non-operating situations.

## Technical Information

The information provided below will help the technician diagnosis specific situations that will help direct the technician to a reporting mode, acting protection mode and/or a true failure mode.

### ***Communications Faults:***

UI Code 179 – Communication Loss have been seen due to no earth/equipment ground or poor earth/equipment ground. If code is active or seen in history check for good earth/equipment ground referenced to an outdoor grounding rod.

### ***Nuisance/Reported Fault Codes:***

Code 61, 65, 66, 67, 71, 79 and 92 are some of the codes that have been seen at random events causing nuisance reports. The information provided will help clarify what the code actually indicates to the system:

Code 61 – Fan Inverter Fault (OFM) fails to start (misaligned rotor), will retry and succeed in majority of instances after a 6 minute delay.

Code 65, 92 – DC Voltage Low, occurs with power loss or other fault code that shuts down the system rapidly.

Code 66 – Outdoor Fan Drop Out (OFM) may or may not be actually dropping out.

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.

# TECHNICAL INFORMATION COMMUNICATION



**United  
Technologies**

Building & Industrial Systems

Code 67 – Stator Heat Fault, Stator heat temporarily unable to operate, will retry again after a 6 minute delay.

Code 71 – Related to overcharging and loose HPS connectors.

Code 79 – Compressor/Inverter Fault, Compressor fails to start (misaligned rotor), will retry and succeed in majority of instances.

## **Over-Charge:**

Due to the compact size of 5 stage inverter units, precise charging is necessary for proper system operation. Use of subcooling charging method, along with accurate tools, will result in minimizing nuisance fault codes and optimizing system performance at high ambient temperatures.

Code 31 - High Pressure Switch Open is the most common symptom of overcharged condition but some software versions may display other codes as well. Early software (V01, V02, V03) common codes that may be displayed when code 31 is causing a system shutdown - Code 65,71,75,79,92. In addition, V01, V02, V03 software versions require high voltage power cycle to clear code 31 and resume system operation. Later software releases (V4 and V5) will self-recover after an instance of code 31 but will limit maximum stage of operation in subsequent cycle. Normal system operation will then resume.

Code 98/99 – High Torque/High Torque Lockout can be another symptom of possible overcharging; high subcooling causing the compressor to exceed a predefined torque limit. Once a code 98 occurs the system will attempt to manage itself by limiting available stages. Multiple instances of code 98 will result in limiting available stages in steps (4, 3, 2, and 1) to the lowest available. If high torque condition still exists, a code 99 will then lockout the system from operating. Once demand is removed and re-applied by wall control, normal system operation will resume. Codes may reappear if the root cause is not corrected.

Code 75 - Maximum Power Mode -Temp may also indicate an overcharged situation during high ambient operation. The inverter monitors its' operating temperature and will protect itself by limiting power output. The system will react similarly to code 98 but will reduce compressor speed gradually instead of reducing stages in order to maintain maximum capacity delivery while protecting electronics in outdoor unit. Several factors affect the conditions where this code may be generated including overcharge, indoor coil size and cleanliness, indoor airflow settings, total line set length and actual outdoor temperature. Once demand is removed and re-applied by wall control, normal system operation will resume. Codes may reappear if the root cause is not corrected.

The two tables below provide certain situations that indicate an overcharge condition other than by only displaying a 31 and/or 75. Information below will help streamline troubleshooting efforts.

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.

# TECHNICAL INFORMATION COMMUNICATION



**United  
Technologies**

Building & Industrial Systems

2, 4 & 5 Ton AC/HP		
AOC Board Software	Nominal Charge	10% Overcharge (Moderate) to 20% Overcharge (Severe)
Version 1	98, stage limiting	98, eventually 99
Version 2	98, stage limiting	98, eventually 99
Version 3	98, stage limiting	98, eventually 99
Version 4	98, if temp continues to 125 may cause code 75&31	98, eventually 99
Version 5	98, stage limiting	98, eventually 99

3 Ton AC/HP		
AOC Board Software	Nominal Charge	10% to 20% Overcharge (Moderate to Severe)
Version 1	75, rpm limiting, may trigger code 31	31,65, 71,75, 79, 92 (different codes during different cycles)
Version 2	75, rpm limiting, may trigger code 31	31,65, 71,75, 79, 92 (different codes during different cycles)
Version 3	75, rpm limiting, may trigger code 31. Requires power cycle.	75, 31. Fault does not clear w/o power cycle.
Version 4	75, rpm limiting, may trigger code 31. 31 Code clears by itself.	31. Code clears by itself
Version 5	75, rpm limiting, may trigger code 31. 31 Code clears by itself.	31. Code clears by itself

*Code 31 or 71 – High Pressure Switch Open or Compressor Drop Out (respectfully) may occur if the HPS Molex Plug has a loose or intermittent connection causing a nuisance code 31 (Version 3, 4 & 5) or 71 (Version 1 & 2) in certain conditions.*

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.

# TECHNICAL INFORMATION COMMUNICATION



**United  
Technologies**

Building & Industrial Systems

## ***Operation Sequence (Software modifications):***

System's operation, reporting and protection have been modified since the initial product launch. Information provided below shows the history of the quality improvement modification by versions of the AOC software.

Version 1.0 – (s/n: 2014Exxxxx through 3614Exxxxx)

- Initial production release

Version 2.0 – (s/n: 3714Exxxxx through 4614Exxxxx)

- Changed the forced defrost or stage down suction pressure threshold to  $\leq 33$  PSIG.

Version 3.0 – (s/n: week 4714Exxxxx only)

- Changed charging amounts and coil parameters thresholds.
- Changed charging airflows, torque values and sub cooling values
- Adjust Cooling stages allowed above 115F OAT
- Corrected HPS issue to show HPS open instead of compressor drop out (fault 71)
- Fault code 59 corrected for A/C Only

Version 4.0 – (s/n: 0315Exxxxx through 2215Exxxxx)

- Added odd models (13, 37 & 49)
- Changed fault code names
- Removed disable stator heater option to correct stator heater issue
- Added a 10 minute 2<sup>nd</sup> stage ramp time for first cycle after power up (reduces # of 79 fault codes) displays Code 68 events
- Added clear of MOC fault codes after HPS fault (fault was latching causing 2 hour lockout). System will now restart after 15 minutes as long as HPS closes while system is not running.

Version 5.0 - (s/n: 2315Exxxxx to current)

- Will start the fan faster after the compressor starts running (will not wait 9 seconds like it did in version 4 and prior to start running the fan)
- Corrected A/C Only cooling staging issue (would not stage to stage 5 when non-communicating thermostat was requesting Y1 and Y2).

## ***Next Steps:***

BIS team is finalizing a new software and service manual release to help eliminate nuisance fault codes, better identify system conditions and reporting structures to improve system operations.

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.